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Rejuvenating Agents for Hot Mix Recycling of Bituminous Surfacing — Specification

ICS 75.140

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भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.gov.in www.standardsbis.in

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Bitumen, Tar and Related Products Sectional Committee, PCD 06

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards after the draft finalized by the Bitumen, Tar and Related Products Sectional Committee, had been approved by the Petroleum, Coal and Related Product Division Council.

Recycling of deteriorated bituminous pavements is being done with increasing frequency for its economic, environmental merits and benefits of conserving bitumen. The objectives of recycling are to reuse the two ingredients of bituminous concrete such as aggregate and bitumen, and to restore the desired performance properties of the oxidised bitumen. Recycling is carried out hot or cold, depending on the condition of the deteriorated pavement, construction procedure, availability of equipment, and cost. This standard deals rejuvenating agent to be used in hot recycling of bituminous surfacing.

Based on their kinematic viscosity (at 60°C), rejuvenating agents are classified in three grades, namely:

RA 25,

RA 100, and

RA 400.

The viscosity ranges of rejuvenating agents are designed to avoid overlap and to provide sufficient flexibility to satisfy a wide range of mix proportions.

The choice of rejuvenating agent grade depend on the amount and hardness of the bitumen in the aged bituminous surfacing. In general, the lower viscosity rejuvenating agent can be used to restore aged bitumen of high viscosity and vice versa. RA 25 is highly softer grade, RA 100 is medium soft grade and RA 400 is normal softer grade. The RA 25, RA 100 and RA 400 are useful for rejuvenation of oxidized bitumen in Reclaimed Asphalt Pavement (RAP) having penetration in the range of 20-35, 36-50 and 51-70 respectively.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

REJUVENATING AGENTS FOR HOT MIX RECYCLING OF BITUMINOUS SURFACING — SPECIFICATION

1 SCOPE

This standard prescribes requirements and methods of sampling and tests of rejuvenating agent in hot recycling of bituminous surfacing.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreement based on the standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No./ Other Publication	*Title*
73 : 2013	Paving bitumen — Specification (*fourth revision*)
334 : 2002	Glossary of terms relating to bitumen and tar (*third revision*)
1448 (Part 69) : 2013	Methods of test for petroleum and its products: Part 69 Determination flash and fire points — Cleveland open cup method
1201 : 1978	Methods for testing for tar and bituminous materials — Sampling
1202 : 1978	Methods for testing for tar and bituminous materials — Determination of specific gravity (*first revision*)
1206 (Part 2) : 1978	Methods for testing for tar and bituminous materials — Determination of viscosity: Part 2 Absolute viscosity (*first revision*)
1212 : 1978	Methods for testing for tar and bituminous materials: Determination of loss on heating (*first revision*)
9382 : 1979	Methods for testing for tar and bituminous materials — Determination of effect of heat and air by thin film oven tests
ASTM D4124 − 09	Standard test method for separation of asphalt into four fractions

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 334 shall apply.

4 CLASSIFICATION

Rejuvenating agents shall be classified into following three grades, based on their viscosity at a temperature of 60°C:

a) RA 25 — RA having viscosity between 250 to 1000 cSt.
b) RA 100 — RA having viscosity between 1001 to 4000 cSt.
c) RA 400 — RA having viscosity between 4001 to 16000 cSt.

5 REQUIREMENTS

5.1 The rejuvenating agents must be homogeneous free-flowing at pumping temperature.

5.2 The rejuvenated bitumen thus prepared shall conform to IS 73. In case, it fails to conform to IS 73, it must meet compliance of performance based grade required by user agency.

5.3 The rejuvenating agent shall comply with the requirements given in Table 1 when tested as prescribed in col **6** of Table 1.

6 PACKING AND MARKING

6.1 Rejuvenating agents shall be packed in closed drums, barrels or tanks. Plastic or aluminium containers are suitable for storage of rejuvenating agents.

Table 1 Requirements of Hot-Mix Rejuvenating Agents

(*Clause* 5.3)

Sl No.	**Characteristics**	**Requirements**			**Method of Test, Ref to**
		RA 25	**RA 100**	**RA 400**	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Viscosity at 60°C, cSt	250 – 1000	1001 – 4000	4001 – 16000	IS 1206 (Part 2)
ii)	Flash Point, COC,°C, *Min*	220	220	220	IS 1448 [P : 69]
iii)	Saturates, percent by mass, *Max*	30	30	30	ASTM D4124 − 09
iv)	Viscosity ratio	3	3	3	A
v)	Loss in mass, percent, *Max*	0.5	0.5	0.5	IS 1212
vi)	Specific gravity at 27°C, g/cc	To report	To report	To report	IS 1202

6.2.1 Each container of rejuvenating agent shall be legibly and indelibly marked with the following:

a) Name of the product;
b) Indication of the source of manufacture;
c) Month and year of manufacture;
d) Batch number or code number;
e) Safety hours number; and
f) Expiry date.

6.2.2 *BIS Certification Marking*

The material may also be marked with the Standard Mark.

6.2.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations made thereunder. The details of the conditions under which the licence for use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

7 STORAGE, HANDLING AND SAFETY PRECAUTIONS

7.1 Rejuvenating agents shall be stored in closed drums, barrels or tanks. Plastic or aluminium containers are suitable for storage of rejuvenating agents.

7.2 Direct contact with skin shall be avoided.

7.3 Material shall be stored or placed away from fire.

8 SAMPLING

All sampling shall be carried out in accordance to IS 1201.

ANNEX A

[*Table* 1, *Sl No.* (iv)]

DETERMINATION OF VISCOCITY RATIO

A-1 The rejuvenating agent residue from thin film oven test shall be prepared as per the procedure given in IS 9382.

A-2 Viscosity of the residue obtained from thin film oven test shall be determined at 60°C as per the method prescribed in IS 1206 (Part 2).

A-3 CALCULATION

$$\text{Viscocity Ratio} = \frac{\text{Viscocity of Residue obtained from thin film oven test. }60^\circ\text{C, cSt}}{\text{Original Viscocity, }60^\circ\text{C, cST}}$$

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Amendments Issued Since Publication

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BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices:		*Telephones*
Central	Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	2323 7617 2323 3841
Eastern	1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi KOLKATA 700054	2337 8499, 2337 8561 2337 8626, 2337 9120
Northern	Plot No. 4-A, Sector 27-B, Madhya Marg CHANDIGARH 160019	265 0206 265 0290
Southern	C.I.T. Campus, IV Cross Road, CHENNAI 600113	2254 1216, 2254 1442 2254 2519, 2254 2315
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